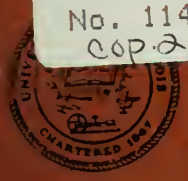

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Making Sense of Complex Industries

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Making Sense of Complex Industries

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Making Sense of Complex Industries

Abstract

Many strategic management models either ignore or severly underestimate the complexity present in most strategic situations. This paper identifies some of the key sources of complexity and suggests some ways in which this complexity can be handled. It argues for the importance of the fine-grained historical industry study in identifying key strategic dimensions and suggests that is should be supplemented with the more fashionable strategic groups analysis.

Introduction

During the last two decades, in particular, a substantial body of literature has been developed in the fields of strategic management, strategic planning, corporate and business policy and related topics. This literature, which is admirably reviewed in Schendel and Hofer (1979), owes much to the prior writings of Alfred Chandler [1962, 1977] and the decades of case writing and research undertaken at the Harvard Business School.

More recently strategic management has been subject to scrutiny through a wide variety of disciplinary "lenses" and models, including Porter's influential volume (Porter (1980)) on competitive strategy.

These "partial" models have been borrowed from such disciplines as industrial organization, organizational behavior, international business, and decision theory. However, many of these "partial" models either ignore or severely underestimate the complexity present in most strategic situations.

A careful review of sources of strategic complexity (see Bower (1982), Porter (1980)) will almost always give priority to the international context, technical change, the competitive environment and government/political intersections at or near the top of the list.

The examination of strategic complexity through many different "lenses" provides strategists with a series of opportunities with which to better understand complex strategic situations. Yet the very diversity of these disciplinary perspectives means that strategists have to assess the implications

of using each approach and judge between the often conflicting conclusions offered by the set of "partial" models.

This paper argues that many constituencies try to "make sense" of complex industry environments. These range from industrial organization researchers (such as Porter (1980, 1982), Caves (1980), Teece (1984), Nelson and Winter (1982), Rumelt (1981), Williamson (1975, 1981) and Schmalensee (1982)) who attempt to develop richer economic theory through to firm-level strategists and governmental policy-makers (e.g. anti-trust) who try to understand the bases for competition in particular industry environments.

In a paper written for an anti-trust symposium Porter (1981: 449-451) stresses the value of in-depth industry histories in understanding industry environments and identifying firms' strategic interactions on a longitudinal basis. He recognizes four main advantages: (Porter, 1981: 450).

> "First, its emphasis is longitudinal, built around a careful re-creation of competitive moves and other events in the sequence in which they occurred. Second, it is broad and quite detailed in its coverage of firm behavior and industry events rather than focusing on one or a few elements of competitive behavior such as investment or pricing. Third, it emphasizes the uncertainties present in predicting the future that bear on the decisions facing firms. Fourth, it places great emphasis on a full and complete description of each major competitor, including its full range of activities in all markets in which it competes, and a great deal of emphasis on "internal" factors such as the identity and backgrounds of management, the evolving organizational arrangements in place, et cetera.

In the same paper (1981: 474) Porter also points out that there is an increasing incidence of industries in which strategic interaction is global. Such global industries must also be

studied in depth since they change the rules of the competitive environment (Gluck (1983)). Thus, if firms more clearly understand the nature of global competition then they should be better able to re-formulate their competitive strategies.

Porter's strong endorsement of the industry history approach supports an important proposition in this paper, namely, that further "rich", fine-grained (Harrigan (1983)), in-depth, industry studies should be carried out with the aim of developing richer hypotheses and theories about strategic interaction, competitive strategy and global competition. Such studies should attempt to make sense of the set of complex, competitive environments by careful questioning of a number of issues. For example, what analogies or experiences (Porter, 1980, Chapter 3) do managements draw upon in addressing particular strategic problems? Do they develop strategies from insights gained through "personal" experience or from the examination of strategies borrowed from other firms? Alternatively, do they identify competitive concepts and approaches as shared by industry members and base their strategies on competitive norms? What are the external forces such as technology which lead to change in the bases of an industry competition? What are the appropriate units of analysis? What are the industry and environmental conditions which affect strategy formulation and shape the cost of changing position within an industry? Thus, with complexity better integrated into the analysis more insight can then be gained about what constitutes a global industry and how global strategies may be formulated.

The purpose of this paper is firstly to provide a review of

various definitions and important concepts (such as value-added chains) which will be used in the paper. The authors argue that richer industry studies need to be written and draw from their own recent experience with major contemporary industry studies. This includes such industries as personal computers, reprographics and automobiles. Generalizations and common factors emerging from a study of the reprographics industry are then identified. Some implications for theory development, research design, methodology and data base construction will complete the paper.

Literature Review

Introduction

There has been much discussion in the recent literature of industrial organization about whether the firm or industry or some other intra-industry group stratification (the so-called strategic group (Porter (1980: 129)) is the appropriate unit for analysis. It is clear that most business firms are multi-product, sell in more than one market and have grown by diversification. The industry as conventionally understood produces a range of different products all of which are not close substitutes, and uses a variety of technical production processes. It, therefore, becomes unclear where the boundaries of the industry should be drawn. Many economists have concluded that the concepts of market and industry should be viewed as complementary and the emphasis employed should reflect the problems under consideration. According to Joan Robinson

(1956):

> "Questions relating to competition, monopoly and oligopoly must be considered in terms of markets, whilst questions concerning labor, profits, technical progress, localization and so forth have to be considered in terms of industries."

The newer concept of strategic groups focuses upon the importance of intra-industry strategic groupings in understanding differences across firms within an industry. It fits neatly between the supply idea of an industry and the demand idea of a market. The defining characteristics of strategic groups arise from the nature of the mobility barriers (Caves and Porter (1977)) and isolating mechanisms (Rumelt, 1981) which protect the groups. The three sources of mobility barriers most commonly advanced (McGee and Thomas (1984)) are market related strategies, general supply characteristics of the industry, and the organizational and boundary choices of the firm - each of them being decision variables for the firm.

Strategic groups offer an opportunity for business policy researchers and business strategists to enrich their understanding of the nature of industries and the strategic interactions amongst firms. In particular, the concept offers a distinctive slant on the identification of relative competitive position and suggests a systematic and comprehensive way of assessing strategic capability in terms of the framework of relative competitive advantage.

The literature review which follows builds upon this notion of assessing firm strategic capability by reference to the industries and environments in which firms operate. First, the authors review the rich tradition of research in industry-based

studies and industry histories and conclude, inter alia, that there is a lack of established methodologies for treating complexity. Second, key sources of industry complexity are identified including notions of mobility barriers, value chains and global industries. Third, research in other areas of sccial science, notably organizational behavior and psychology is briefly reviewed. This is attempted in order to provide further insights into how strategists may reason by analogy or imitate other firm strategies in the context of strategic decision-making. It is possible that better industry sense-making will result from examination of these alternative perspectives. As an example, the discussion of alternative perspectives is focussed around the strategic group concept, a device formulated by Porter (1980) to make sense of competition and competitive advantage. The findings of recent empirical grouping studies are reviewed to determine whether they provide useful insights for firm conduct and competitive strategic interaction in the context of complex industries.

Industry Studies

Many different intellectual traditions are represented in industry-level studies. These range from business history to the domain of industrial organization economics and involve numerous researchers and research approaches. Table I lists some of the main features and perspectives of each approach and provides references to researchers whose work is most closely associated with those perspectives.

TABLE I ABOUT HERE

The main differences in the conduct of alternative types of industry studies are shown in Table I. In particular, they vary in terms of the aims and purposes of each type of study and the research methodology used by the investigator. For example, more narrowly defined data sets (drawn from government and industry-level sources) and more refined and sophisticated analytical approaches (often using econometric techniques) are used to gain answers to specific questions concerning industry-level profitability, efficiency and monopoly power. This more narrow purpose and focus has been extensively used in traditional industrial organization studies, some anti-trust analyses and in assessing the economic impacts of technology and research and development in different industries. More detailed, broader purpose studies have been developed for case study and teaching purposes, and have been evident in some more recent anti-trust cases (Sullivan (1981)) and industrial policy debates (Lawrence and Dyer (1983)). These studies generally involve little formal analysis and allow the writer selectivity in the choice of data, insights and phenomena reported. An underlying aim of these broader studies is to reflect the contextual complexity of industry studies. Therefore, they report a wide range of firm-level phenomena including issues of organizational design, leadership, and strategy to achieve firm objectives. The focus of many of these studies is on the firm as the unit of analysis, and seeks to enrich understanding about the strategic interaction and rivalry between competitors and on the role of the general

TABLE I: DIFFERENT FORMS OF INDUSTRY STUDIES

MAJOR INTELEECTUAL TRADITION	PURPOSE	DATA BASE	UNIT OF ANALYSIS	RESEARCH APPROACHES	REFERENCES
Industrial Organization Economics	Study of Industry Structure, Behavior, Performance, Judgment of Competition, Profitability, Efficiency and Monopoly Power.	Typically published government or industry source data	Industry Level	Mainly statistical/ econometric. Some case studies but rich tradition of European researchers in industry case studies.	Porter (198 Scherer (19 Shepherd (1 Adams (1977 Shaw and Sutton (19
Business History	Mapping industry/ business evolution through time. Insight into historical evolution of business organizations and the role of strategist/ entrepreneur.	Mix of Sources -Government Statistics -Annual Reports -Newspapers -Biographies -Published Speeches	Mainly industry but also business focus.	Longitudinal Analysis -History -Content Analysis -Analysis of Speeches -Newer Statistical Analysis	Bateman (198 Chandler (19 197 Cole (1959)
Public Policy	Monitoring of Competition Policy -Anti-Trust -Mergers Development of Industrial Policy Options	Government Statistics, Industry Level Investigation Focussed studies of companies using Annual Reports, Speeches, etc.	Mainly industry level.	Mainly statistical analysis. Some richer mapping, industry history studies involving firm/organization conduct.	Porter (1981) Salop (1981) Sullivan (198 Lawrence and Dyer (1983) Reich (1983)
Strategy	Case Development -Teaching Industry Analysis -Firm Strategies -Generic Strategies	Mix of Sources -Statistics -Annual Reports -Business Periodicals -Company Visits Use of Compustat, PIMS Data Base	Firm Level Firm and industry level	Case writer selectivity Participant observation Rich case observations with statistical, matrix mapping analysis.	Andrews (1971 Christensen, Andrews et a. (1980) Glueck (1980) Porter (1980, 1982) Harrigan (1983
Technology	Impacts of Technology on Industry, Diffusion of Innovations, Economics of R&D, First/ Second Mover Advantages?	Industry Level Data Bases of Economic, Patent and Research Activity Phenomena Usually Tailor Made	Mainly industry level	Mainly statistical, econometric. More process, firm-level in the diffusion of innovations	Freeman (1983) Kantrow (1982) Mansfield (196 1977) Schendel, Cooper (1977)

manager as the architect of organizational direction and purpose.

Clearly, these industry studies offer many different, but not always synthesized insights into the analysis of competitive advantage in complex industry settings. However, some general conclusions emerge for the conduct both of future studies and for theory development. First, there seem to be a lack of both established metholodologies, and rules of evidence, for handling problem complexity and reporting complex phenomena in a systematic fashion in order to allow replication by other researchers. Second, in the more finely defined studies there is often a denial of complexity (and the role of other information and evidence) in formulating particular relatively narrow hypotheses and in establishing or refuting the validity of these hypotheses. Third, the theoretical and methodological cross currents from the different disciplines do not seem to be integrated effectively and thus do not lead to richer investigations of complex phenomena.[1] As a result it appears that current industry studies of complex phenomena do not make clear contributions to the development of theory in the specialist disciplines and intellectual traditions. While this is a continuing difficulty in the management research field, the search for a useful measure of reconciliation and synthesis amongst the various forms of industry studies can have both theoretical and practical advantages in regard to the advancement of strategic management. Perhaps themes such as policy dialogue (Thomas (1984)) and triangulation in research strategy to achieve

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[1] Notable exceptions are Porter (1982) and Harrigan (1983).

convergence of conclusions (Denzin (1978), Jick (1979) may facilitate the search for mechanisms to enrich the newer inter-disciplinary theories such as Rumelt's (1981) Strategic Theory of the Firm and Nelson and Winter's (1982) Evolutionary theory of the firm.

Sources of Complexity

A number of writers, particularly Aldrich (1979), Caves and Porter (1977), Galbraith and Schendel (1982), McGee and Thomas (1984), Porter (1980: 127-128) and Rumelt (1981) have addressed a wide range of economic, organizational and environmental sources of complexity affecting strategic decision-making at the firm level. Table 2 provides a listing of sources of complexity drawn mainly from these references. For example, concepts such as mobility barriers (Caves and Porter (1977) and isolating mechanisms (Rumelt (1981)) together define from primarily economic perspectives, key strategies available to firms, or groups of firms within industries, and link them to unique firm advantages and characteristics such as the possession of an important financial resource or technological advantage. Aldrich (1979), Ackoff (1970) and others have stressed the difficulties of organizations' adapting to their environments and matching strategies to changing circumstances. They argue that complexity involves both controllable or, at least partially controllable variables such as marketing, financial and production decisions and uncontrollable variables such as changes in technology and governmental policy. While the former endogenous variables are

largely controllable by management, uncontrollable (exogenous) variables influence strategy formulation but cannot be directly handled. The organization's ability to handle environmental change is perhaps the key challenge to strategists in the 1980's.

TABLE 2 ABOUT HERE

Drucker (1980) in his book entitled Managing in Turbulent Times suggests that the trend towards global competition represents the most significant structural change facing businesses and governments today. Porter, like Drucker, makes a distinction between international competition and global competition. "A global industry is one in which the strategic positions of competitors in major geographic or national markets are fundamentally affected by their overall global positions" (Porter, 1980: 275).

Globalization, therefore, can be examined as a major environmental change. How should organizations confronting globalization seek to modify their strategic positions? Kogut (1984) and Williams (1984), amongst others, endorse the viewpoint that the concept of the "value-added" chain is a useful framework with which to understand the bases of industry membership and global competition and thereby develop adaptive corporate strategies. Williams (1984: 2) defines "value-added" in the following terms: "Loosely put, 'value-added' is defined as what is added to the product during its production. The 'value-added' influences productivity achieved by a firm and its cost structure over time. The impact of the value added is reflected in competitive behavior, and, in turn, the formation of strategic

TABLE 2

KEY SOURCES OF COMPLEXITY

Endogenous Factors	Issues	Aims
Organization and Management	Ownership Structure -Single Business v. Multi-Business Capital Structure -Leverage, Relationship to Parent Organization Structure -Design of Organizational Systems and Procedures	Firm aims to develop firm embodied skills such as unique resources, reputation, image, development of patents, etc.
Competitors and Markets	Competitors: Number, Type, Geographic Position Markets: Geographic Coverage of Markets: Global/National Market Segmentation Product-Line and Marketing Mix	Firm aims to develop a sense of competition and of sources of competitive advantage in market niches.
Product Initiation and Development	Value Added Chain Length Substituation Patterns Vertical Integration and Dependence Horizontal Relatedness Scale Effects R&D Capability Nature of Manufacturing Process	Firm aims to capture rents, value added where appropriate
Exogenous Factors	**Issues**	**Aims**
International Trade	Globalization Competitive/Comparative Advantage	Firms aims to assess the effects on the value chain of the linkage between national base distinctive skills and internationalization.
Technology	Inventions, Innovation, Technological Change	Firm aims to assess effect on value chain of changes in technology. Clear effects on competitive advantage.
Government	Government as Policy Formulator, Rule Setter, Owner/Purchaser	Firm aims to assess effect on value chain of government intervention.

Note: This Table adopted from Aldrich (1970), Ackoff, Galbraith and Schendel (1982), Hufsi and Thomas (1984), Porter (1980)

groups within an industry."

TABLE 3 ABOUT HERE

In Table 3, a modified version of Williams categorization of industries in terms of "value-added" is presented to throw light upon the linkage between "value-added" and globalization. Kogut (1984) provides additional important insights although defining the value-added chain in terms of contribution to the market value of the firm. He argues that a measure of economic rents is needed which identifies excess return on investment for each link of the value-added chain. Firm strategies in country-centered markets are, typically, based on specialization in specific links of the value-added chain. However, in global markets strategies rest on the exploitation of economics captured along and between value-added chains (Kogut (1984): 2). Kogut thus adds the concept of economies of scope (Teece (1980)), the sharing of resources to achieve synergy, to economies of scale and learning effects in order to capture the process of exploitation of economic advantage along multiple value-added chains.

It should be noted that the use of the term "value-chains" is associated with the firm's decision process in relation to business-unit competition. Firms have a set of alternative "value-chains" from which they can choose and this choice results in different competition sets and strategic postures. The firm's strategic aim is to match its distinctive skills (or strategic capabilities) with one of the alternative competition sets available in the environment. Once this strategic choice is made

TABLE 3

TAXONOMY OF INDUSTRIES BY VALUE-ADDED/PRODUCTIVITY BASE

Definition of Industry Types	Characteristics and Focus of Competitive Advantage	Examples	Sensitivity to Globalization
Class I - Value Added is Constrained From Achievement of Significant Cost-Based Productivity Increase Through Economies of Scale or Learning by Doing	Fragmented Industries Competition in Terms of: Geography, Reputation of Individuals, Regulation, Individualized Service, Creative Skills, Custom Engineering	Computer Software, Entertainment, Investment Banking, Consulting, Embryonic Technologies	Low Resistant to Globalizati because numerous barrier to consolidation of supp and demand
Class II - Value Added Characterized by Modest Cost-Based Productivity Through Learning by Doing and Economies of Scale	Low Cost Rivalry Differentiated Rivalry (Premium Price) Focused Rivalry (Specialization in Small Sub-Segments)	Manufacturing Assembly Based Industries -Steel, Glass, Tire, Appliances, Chemicals, Automated Services	Moderately susceptible Autos - yes Some, but not all heavy manufacturing
Class III - Value Added Which is Subject to Extremely Rapid Cost-Based Productivity Gains Through Learning by Doing and Economies of Scale	Rapid Technological Change and Information Transfer Rivalry -Product Technology -Process Technology -Commodity Technology	Semi-Conductors Fiber-Optics Consumer Electronics Telecommunications	Vulnerable to globalization -Few global or cultural barriers
Transition - Value Added Shifting Permanently from One Productivity Base to Another	Fundamental Change in Bases of Competition Through Deregulation, Patents, Manufacturing Innovations, etc.	Retail Banking (I → II) Telecommunications (I → II → III) Biotechnology (I → III)	Dependent on stage of transition
Hybrid - Value Added Coupled in Two or More Productivity Bases	Identification of of Competitive Advantage Difficult	CAD/CAM Robotics Personal computers	Not clear, situation specific

the examination of the forces which drive the "value chain" leads firms towards an understanding and definition of an "industry" (whether global or country-centered) within which competition takes place. Close examination of the final customers for each value chain leads to the definition of markets and allows more complex analyses of competition and market segmentation to be undertaken.

It is proposed here that the value-added chain concept is an important means of organizing firm-level understanding of complex situations. Table 3, using "value chain" ideas, provides a framework both for forming strategic groups within industry settings and for analyzing the potential sensitivity of each industry setting to the threat of globalization. Table 2 shows clearly that strategy formulation can become more complex in environments of global competition. Factors such as the influence of distinctive firm skills in particular country markets, and the role of government policies in setting the "rules of the game" in many countries can complicate firms' strategic choices. Governments often operate strategically in international trade through the formation of state-owned enterprises as competitors (Hafsi and Thomas (1984)) and the establishment of quota control or subsidy policies for "home-based" enterprises.

Kogut (1984: 38, 39) shows that full awareness of international competition does not follow simply from an extension of the strategic analysis of competition in country-centered markets. He believes that more research should be carried out on understanding strategic groups in the

international domain and on managing the environmental variance of world competition. He concludes by identifying some of the parameters which are important in making sense of globalization and global markets:

> "Global positioning consists, therefore, of three elements. First, is the transferring of strategic assets between different markets which permit the exploitation of the economies of scale, scope, learning and real options. Second is the differentiation of products to adapt to national arenas and to exploit upstream competitive advantages. The third element is the flexibility and bargaining strength that a multinational network provides in managing stakeholders in diverse environments."

In summary, the argument in this section of the literature review promotes the importance of the "value chain" in understanding the bases for industry competition in settings involving complexity (as shown in Table 2). The major environmental structural force of globalization and the resulting formation of global industries is discussed as an example of complexity and the role of the value chain in aiding strategy formulation is assessed (see Table 3).

In the next section some alternative cognitive and organizational perspectives for making sense of industry complexity are discussed using the strategic groups concept as an example.

Sense-Making and Strategic Groups

The term "strategic groups" was originally coined by Michael S. Hunt in his doctoral dissertation (1972) to contribute to his exploration of the performance of the white goods industry in the 1960's. Porter (1980: 129) provides the accepted definition of

a strategic group in terms of the similarity of competitive behavior:

> "A strategic group is the group of firms in an industry following the same or a similar strategy along the strategic dimensions.... Usually, however, there are a small number of strategic groups which capture the essential strategic differences among firms in the industry."

TABLE 4 ABOUT HERE

The main studies in the area of strategic groups are summarized in Table 4. Most of these studies are "data-driven". That is, they identify a number of key strategic dimensions drawn from Porter's (1980: 127) or McGee and Thomas (1984) listing of key strategic variables and typically use cluster analysis with data bases such as COMPUSTAT to form groups of firms who "cluster" together in terms of their observed strategic behavior. Yet despite ten years of research there remains confusion about the concept and its linkage to the strategic management of firms. Criticisms have been voiced about whether the observed groups make sense to strategists or other interested parties. Little follow-up with industry participants has been reported except in the case of the continuum of rich studies of the beer industry carried out at Purdue (Hatten (1974), Hatten and Schendel (1977) and Hatten and Hatten (1984)). We have little knowledge to tell us why some firms position their strategies close to those of other firms. A study of strategists' beliefs and perceptions about competition and competitors in particular industries is clearly needed to identify the frameworks they use in competitive positioning. This would provide an awareness of

TABLE 4

STRATEGIC GROUPS: PREVIOUS STUDIES

Study	Industry	Basis for Strategic Group Formation
Hunt (1972)	"White Goods"	Product Line Basis - degree of product diversification - differences in product differentiation - extent of vertical integration
Newman (1973, 1978)	34 4 digit "Producer Goods" Industries: Chemical Processes	Degree of Vertical Integration
Porter (1973)	38 3 digit "Consumer Goods" Industries	Relative Size of Firm - Leader/Follower Classification
Hatten (1974) Hatten and Schendel (1977)	Brewing Industry	Manufacturing Variables - Number, Age, Capital Intensity of Plants Marketing Variables - Number of brands, price, and receivables/sales Structural Variables - 8-firm concentration ratio - firm size
Hatten, Schendel and Cooper (1978)	Brewing Industry	Manufacturing, Marketing and Financial Variables (Leverage, Merger/Acquisition Behavior)
Caves and Pugel (1980)	U.S. Manufacturing Industry--Sample	Relative Size of Firm
Oster (1982)	19 Consumer Goods Industries from Compustat	Product Strategy - Advertising/Sales Ratio
Ryans and Wittink (1982)	Airline Industry	Financial Strategy Clustering of Residuals from Capital Asset Pricing Model (Security Returns)
Baird and Sudharsan (1983)	Office Equipment/ Electronic Computing	Financial Strategy Variables - Leverage, Current Ratio, Return on Assets, Dividend Payment Ratio, Times Interest Earned, Size
Primeaux (1983)	Textiles Petroleum	Size Investment Behavior
Howell and Frazier (1983)	Medical Supply and Equipment	Customer Groups Served Customer Needs Served (due to Abell (1980))

those key controllable strategic dimensions which strategists' perceive to be important in formulating competitive strategy in the industry. Thus, adding the perceptual data drawn from individual decision-makers to the economic models of competition provided by industrial organization economics perspectives should enable a more general framework for identifying important strategic variables to be developed.

Although Porter (1980: 127/8) lists thirteen variables as sources of strategic differences and variability, he suggests that maybe two to four strategic dimensions should be selected for close attention and that group maps or graphs involving two variables at a time should be drawn to make sense of the particular strategic dimensions at hand. Such mapping processes are a means of getting the strategists to "frame" the problem correctly (McCaskey (1982)), to sense the existence of strategic groupings and to simplify the problem around a number of key strategic dimensions. According to Spender (1981) and Huff (1982), strategists may also borrow "recipes" for strategies from other firms in the industry, particularly strategic groups, and also from a wider set of firms. Through examining these recipes and reasoning by analogy to other sets of experience, strategists may develop other bases for grouping firm behavior.

The search for taxonomies of strategy[2] (Hambrick (1984)) also suggests that strategists need such models of competitive behavior to provide benchmarks for strategy positioning. Mervis

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[2] Examples of such taxonomies are Miles and Snow's (1978) prospectors, analysers and defenders categorization and Porter's (1980) model of generic strategies.

and Rosch (1981) and other researchers in experimental psychology express this need as the search for protypical and stereotypical behavior. The firm closest to the prototype or stereotype then becomes the focal member of the perceived strategic group and provides the "benchmark" for identifying and evaluating key strategic dimensions.

It should be noted that the concepts of mapping, of taxonomies and of industry recipes together with economic theory should lead to the better, and more "grounded" identification of the key strategic dimensions (and sources of dissimilarity between firms) for strategic group formation. Yet even if this objective were to be fully achieved, many problems would still remain in linking the strategic groups concept to firm conduct and the evolution of complex industry settings. In particular, each of the following issues raises questions about the role of strategic groups in analyzing competitive advantage. First, which concept of strategy operationalizes the concept of strategic groups? Is it strategy as intentions or strategy as realizations? In other words we need to question whether many of the factors which identify groups are in fact purposively manipulated by the organization. Borrowing from a biological perspective and an adaptive strategy viewpoint (Boudling (1956), Pondy and Mitroff (1979) and Chaffee (1983)) it can be argued that group membership is merely an observable manifestation of viable niches in the environment and the organization's ability to adapt to them. Organizations which exhibit certain survival traits which <u>cannot</u> be known completely in advance remain. Second, do significant performance differences exist between

strategic groups? Third, do stable strategic groups exist or do their characteristics change over time? What are the determinants of change in the membership of strategic groups? Fourth, which external environmental forces "trigger" changes in the character of strategic groups and their membership?

While each of these issues is an area of future research, it is argued in this section that the strategic group concept is an important device for making sense of competition and competitive advantage. While there is much conceptual and practical ambiguity surrounding the strategic groups notion, it does add usefully to the vocabulary of competitive strategy. Indeed, examining notions of strategic groups and patterns of competitive behavior from the widest possible set of viewpoints is clearly valuable.

Overall, the importance of using multiple frameworks is stressed through the general literature review. It is concluded that by using better frameworks for identifying complexity, we should be better able to synthesize and make sense of complex industry settings particularly those global industries reviewed in Table 3.

In the next section we use the concepts developed through the literature review to argue for many "richer" industry-level studies. Indeed, as an example, we present some insights from a recent study carried out with a co-researcher at London Business School, namely Agha Ghazanfar.

The Notion of a "Rich" Industry Study: The Example of Office Reprographics[3]

It has been argued during this paper that the discipline of strategic management offers a number of partial models and insights for formulating firm-level strategies in complex industries. Since the entire complexity of the industry is important, we have proposed that rich industry studies should be carried out both for theory development and for identifying key strategic dimensions and bases for competition within industries. Our proposition is consistent with Porter's (1981) plea for industry case histories and Porter's (1982) thorough and rich set of cases on competitive strategy.

In studying the office reprographics industry a number of different research lenses were used. For example, the history of the industry in the U.K. was reviewed for the last one hundred years to show how the industry has undergone a series of changes as a result mainly of the influence of technological innovation. Also, the strategic positions of firms were assessed in terms of strategic behaviors along key dimensions. Simple strategic maps were also used to assess methods for analyzing competitive advantage and for forming strategic groups.

The aim of this study was to examine an industry characterized by technological change in which it would be possible to examine relationships between:

(i) technological change and "industry" and "market" boundaries

(ii) technological change and the strategic response of firms

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[3] Thanks are due to Agha Ghazanfar from whose thesis (Ghazanfar (1984)) this section derives its empirical strength.

The first stage of the study, using methodologies common in the fields of business and economic history, concentrated upon the growth of firms and industries. In particular it examined the strategies of firms relative to industry development and developed a typology of firms to categorize the different strategic positions taken by industy participants.

TABLE 5 ABOUT HERE

For example, Table 5 shows the movement of the eight firms who entered the reprographics industry as single-technology firms, or created a new industry, at different periods of time over the 1880-1980 period. Some of these firms, - Xerox, Letraset, Ofrex and Ricoh, - started diversifying out of their basic business whilst it was still growing and became "related product diversifiers" in terms of Rumelt's (1974) taxonomy of diversification strategies. Others such as Gestetner and Ozalid diversified in a small way out of reprographics but remained "dominant product" firms.

The companies shown in Table 5 all started out as single-technology firms within the office reprographics industry. This was not the case with the next set of firms which diversified into the reprographics market from adjacent industries. There were four "Dominant-Product" firms - IBM, Olivetti, A.B. Dick and A.M. - that entered the reprographics market at different stages. The most important of these was IBM entering in the early 1970's when the plain-paper copying business was growing very rapidly.

The third set of firms who entered the industry was the

TABLE 5

FIRMS	STAGE OF GROWTH OF INDUSTRY			
	IN TRODUCTION	GROWTH	MATURITY	
SINGLE PRODUCT FIRMS TO START WITH	GESTETNER (1880-1900)	(1920-1930)	(1950-1970)	(1970-1980) GESTETNER DOMINANT PRODUCT
	OZALID (1926-1940)	(1940-1960)	(1960-1970)	(1970-1980) OZALID DOMINANT PRODUCT
	ROTAPRINT (1927-1950)	(1950-1960).	(1960-1970)	ROTAPRINT (1970-1980) SINDLE PRODUCT
	COLUMBIA (1904-1920)	(1920-1950)	(1950-1970)	COLUMBIA (1970-1980)
	XEROX (1950-1960)	(1960-1975)		RELATED PRODUCT DIVERSIFICATION
	LETRASET (1956-1964)	(1964-1974)		RELATED PRODUCT DIVERSIFICATION
	OFREX (1935-1950)	(1950-1960)	(1960-1970)	RELATED PRODUCT DIVERSIFICATION
	RICOH (1936-1960)	(1960-1975)		RELATED PRODUCT DIVERSIFICATION

Related-Product Diversifiers. Their diversification was related to their photo-chemical technology and the exploitation of synergistic links between the manufacture of optical equipment (cameras), photographic film or paper and such supplies. Three of these firms were American-based multi-national operations (Eastman Kodak, 3M and Nashua), one was European (Agfa-Gevaert) and three were Japanese (Canon, Minolta and Konishiroku).

The reprographics industry can be seen, thus, to have comprised different kinds of firms. These are classified in Table 6. This classification suggests the following typology of firms:

(i) SINGLE TECHNOLOGY PIONEERS/INNOVATORS

(ii) SPECIALIZED SINGLE TECHNOLOGY FIRMS ENTERING LATE

(iii) DOMINANT-PRODUCT FIRMS ENTERING DURING GROWTH PERIOD AND REMAINING DOMINANT-PRODUCT FIRMS

(IV) DOMINANT-PRODUCT FIRMS DIVERSIFYING FURTHER

(V) RELATED PRODUCT FIRMS DIVERSIFYING ONLY BECAUSE OF MARKET/TECHNOLOGY RELATEDNESS

(VI) UNRELATED PRODUCT FIRMS

TABLE 6 ABOUT HERE

In summary, it should be noted that there were three kinds of single technology firms: firstly, those which entered as pioneers and stuck to their technology. Secondly, those who entered as pioneers but made strategic changes, and thirdly those that tried to cater to a world market as specialized, low-cost manufacturers. The dominant category included a stable business (IBM) that had reached a settled position and those that were in the process of diversifying further and were still groping for a

TABLE 6 *Date of entry in parenthesis.

TIME OF ENTRY (DURING LIFE CYCLE OF INDUSTRY ENTERED)

		INTRODUCTION	GROWTH	MATURITY
SINGLE TECHNOLOGY FIRM	REMAINING SINGLE OR DOMINANT	GESTETNER(1880) OZALID(1926) ROTAPRINT(1927) COLUMBIA (1904)	COPYER (1974) MITA (1974)	
	BECOMING RELATED PRODUCT DIVERSIFIERS	XEROX (1950) RICOH (1936) LETRASET(1956) OFREX (1935)		
DOMINANT PRODUCT FIRM	REMAINING DOMINANT		IBM(1970)	
	DIVERSIFYING		OLIVETTI (1979) AM AB DICK (1979)	
RELATED PRODUCT FIRM	NOT DIVERSIFYING FURTHER	KODAK (1950) AGFA (1950) 3 M (1950)	KODAK ( ) AGFA (1972) 3M (1973) CANON (1970) MINOLTA (1974) KONISHIROKU (1971) NASHUA (1974)	
UNRELATED PRODUCT FIRM			SHARP (1974) TOSHIBA (1974)	

final shape to their portfolio. Related Product Firms did not diversify further, suggesting a settled strategy based on technology and market relatedness. These characteristics are shown in Table 7.

TABLE 7 ABOUT HERE

The next stage of the study involved an analysis of the content of strategy at different levels within firms. In particular, it examined whether there is any association between this classification of strategic posture at the corporate level and the operational strategies of firms.

TABLE 8 ABOUT HERE

Table 8 gives a preliminary classification of the types of strategies observed at the corporate level. The business strategies of these firms will now be discussed briefly. In particular, there will be a focus upon whether the study shows any symmetry or linkage between:

(i) the SCOPE of activities of firms and

(ii) the FUNCTIONAL strategies of firms.

TABLE 9 ABOUT HERE

Table 9 lists some of the strategic elements of firms that started off as single technology firms. It can be seen that of the firms that started as single-technology companies, there were three types of business strategies found in the 1970's.

(i) The hardware manufacturers who pursued a <u>Monopolising</u> Strategy using four entry barriers based upon their

TABLE 7

CHARACTERISTICS OF ENTRANTS INTO PPC BUSINESS

		Timing of Entry	Nature of Entry	Strategic change	Vertica Integrati
SINGLE-TECHNOLOGY FIRMS	(i)	First-in : Pioneers	Innovation	Remain the same	V.I.
	(ii)	First-in : Pioneers	Innovation	Become Related-Product	V.I.
	(iii)	During growth	Based on cost-advantage	Remain the same	Not necessary
DOMINANT-PRODUCT FIRMS	(iv)	Early-second: During growth	Appeal of brand name	Remain the same	V.I.
	(v)	Late entrant: During growth	Marketing network	Diversify further	Not full
RELATED-PRODUCT FIRMS	(vi)	Early-second: During growth	Technology or market relatedness	Remain the same	Not necessary

TABLE 8

TYPES OF STRATEGIES OBSERVED AT THE CORPORATE LEVEL

	TYPE OF FIRM	CORPORATE STANCE (STRATEGY) Description	FIRMS IN CATEGO
1.	Pioneer of the past.	Single-Technology firms that pioneered new products and remained single-technology firms or became Dominant-Product	Gestetner Ozalid Rotaprint Columbia
2.	Dynamic Innovators	Single-Technology pioneers that attempted to become Related Product firms some time after their innovations	Xerox Letraset Ofrex Ricoh
3.	Specialised Low-cost producers	Specialised Single-Technology firms entering the industry during growth period	Mita Kogyo Copyer
4.	Powerful brand-name entrant	Dominant-Product firms entering industry during growth period and remaining Dominant-Product	IBM
5.	Other entrants attempting to exploit brand names	Dominant-Product firms entering industry during growth period and going in for further diversification	AM A.B.Dick Olivetti
6.	Entrants exploiting synergy	Related-Product firms diversifying into industry because of market/technology relatedness, and not diversifying further.	Agfa Gevaert Canon Minolta Konishiroku 3M Nashua

TABLE 9

FIRMS THAT STARTED AS SINGLE TECHNOLOGY BUSINESS

	HARDWARE MANUFACTURERS							SUPPLIES STRATEGY		
	GESTETNER	UZALID	ROTAPRINT	XEROX	RICOH JAPAN	MITA COPYER	RICOH INTERNATIONAL	LET-RASET	OFREX	COLUMBIA
PATENTS Considered important	✓	✓	✓	✓	✓	X	X	X	X	X
DIRECT-SELLING NETWORK/HIGH COST SERVICE	✓	✓	✓	✓	✓	X	X	X	X	X
OWN-LABEL Important	✓	✓	✓	✓	✓	X	X	✓	✓	X
VERTICALLY INTEGRATED IN REPRO-GRAPHICS BUSINESS	✓	✓	✓	✓	✓	X	X	X	X	X
HIGH PRICE COST MARGINS	✓	✓	✓	✓	✓	X	X	X	X	X
STRATEGY TYPE	MONOPOLISING					LOW COST MANUFACTURERS		SUPPLIES STRATEGY		

functional strategies (patents, marketing network, brand name, integration). This strategy was based on product differentiation. Those who had innovated new products were prone to following this strategy.

(ii) The low-cost manufacturers of hardware. This was a strategy of hardware. This was a strategy of specializing in production and was not one of differentiated marketing.

(iii) The suppliers of low-cost consumable products. This was the supplies strategy in the pursuit of which product differentiation could be important but a monopolizing posture was not adopted.

The next category of firms was that of the related product diversifiers. These Related Product Firms diversified into the reprographics market because of market and technology-relatedness. What distinguished them from the previous sets of firms was

(i) firstly: that they were already related-product companies

(ii) Secondly: that they remained related product companies

(iii) thirdly: that they did not follow the monopolizing strategy.

The strategy of these firms was based on product differentiation, and some of them (Canon, Minolta, Konishiroku) were also low-cost manufacturers. However, what distinguished them from the "monopolisers" was their policy towards

(i) patents

(ii) direct-selling networks

(iii) use of own-labels

(iv) vertical integration

(v) reliance on a single technology.

Along each of these strategic dimensions their policy was different from that of the single-technology firms discussed

earlier. This is shown in Table 10.

TABLE 10 ABOUT HERE

The discussion of content of strategy in the second stage of the study can now be integrated to provide descriptors of firms: a taxonomy of strategies. The taxonomy of firms (similar to Vesper (1979)), and based mainly on supply-side characteristics), that emerges from this industry is thus of:

(i) MONOPOLIZING - Eliminate competition, establish barriers to entry, and control resources.

(ii) COOPERATION - Join forces with competitor to ensure survival and continued economic performance.

(iii) SPECIALIZATION - Specialize in products and/or production process

(iv) SUPPLIES - Supplier of low-cost consumable products

The taxonomy, which should help in identifying sensible bases for strategic group formation is shown in Table 11.

TABLE 11 ABOUT HERE

The third stage of the study used both the historical analysis and the strategy taxonomy to develop strategic maps, and hence strategic groups of firms in the industry along important strategic dimensions. Some of these maps are shown in Tables 12-16.

TABLES 12 THROUGH 16 ABOUT HERE

In these strategic groups maps we have focussed upon

TABLE 10 STRATEGIC CHARACTERISTICS OF RELATED-PRODUCT COMPANIES

LICENSOR/ LICENCEE	KONISHIROKU	MINOLTA	RICOH	CANON	NASHUA	AGFA GAVEART	3M	
No patent monopoly	✓	✓	✓	✓	✓	✓		PATENT POLICY
Sales through distributors or other firms	✓	✓	✓	✓		✓	✓	MARKETING POLICY
Private-label manufacture or sale of others' products	✓	✓	✓		✓	✓		BRANDING POLICY
Not fully integrated in reprographics business	✓	✓	✓	✓	✓			VERTICAL INTEGRATION
More than one technology in portfolio	✓	✓	✓	✓	✓	✓	✓	TECHNOLOGY
STRATEGY TYPE	COOPERATION					SUPPLIES		STRATEGY TYPE

TABLE 11

A TAXONOMY OF FIRMS ACCORDING TO THEIR SCOPE OF ACTIVITES AND PURSUIT OF BUSINESS STRATEGIES

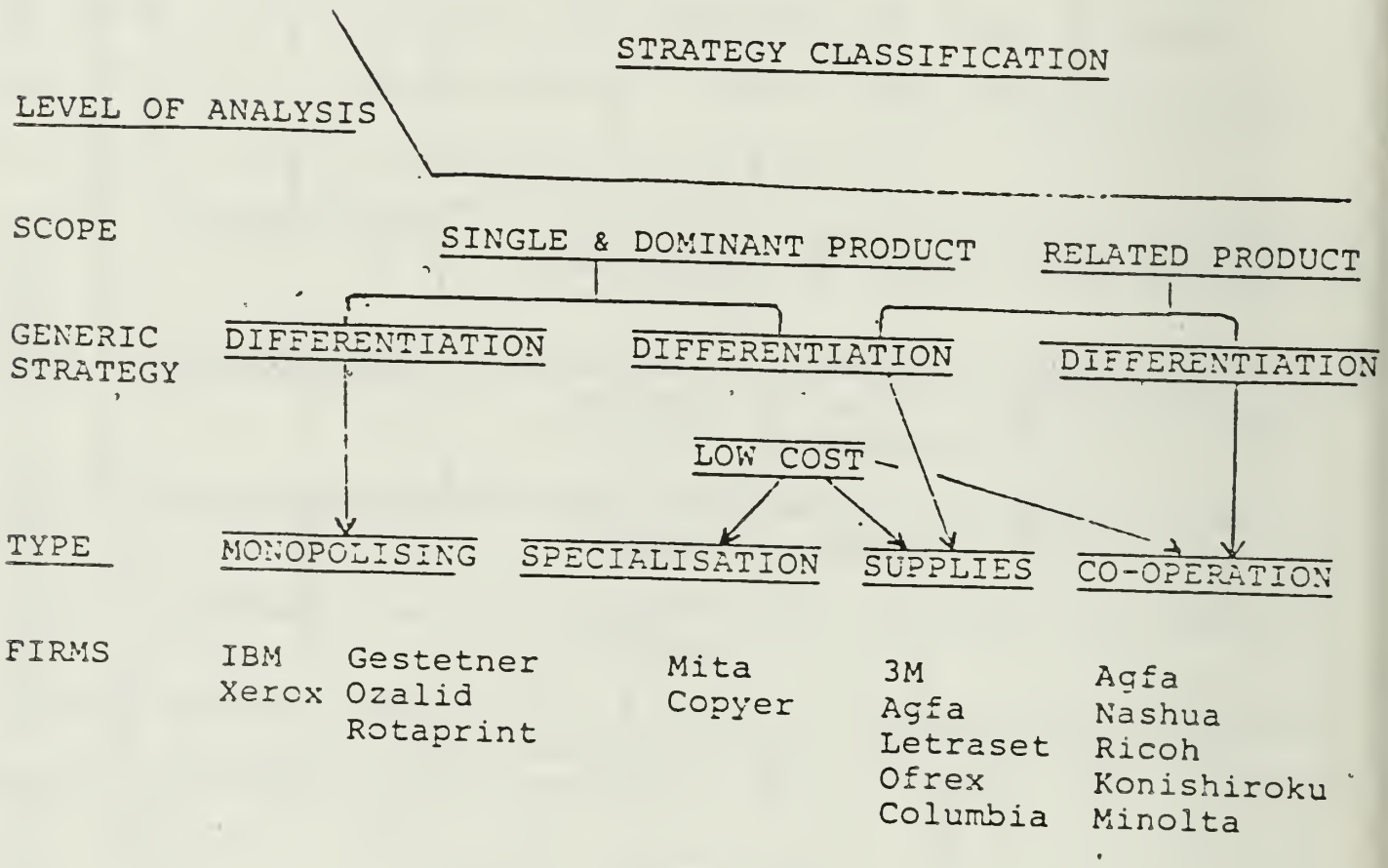


TABLE 12

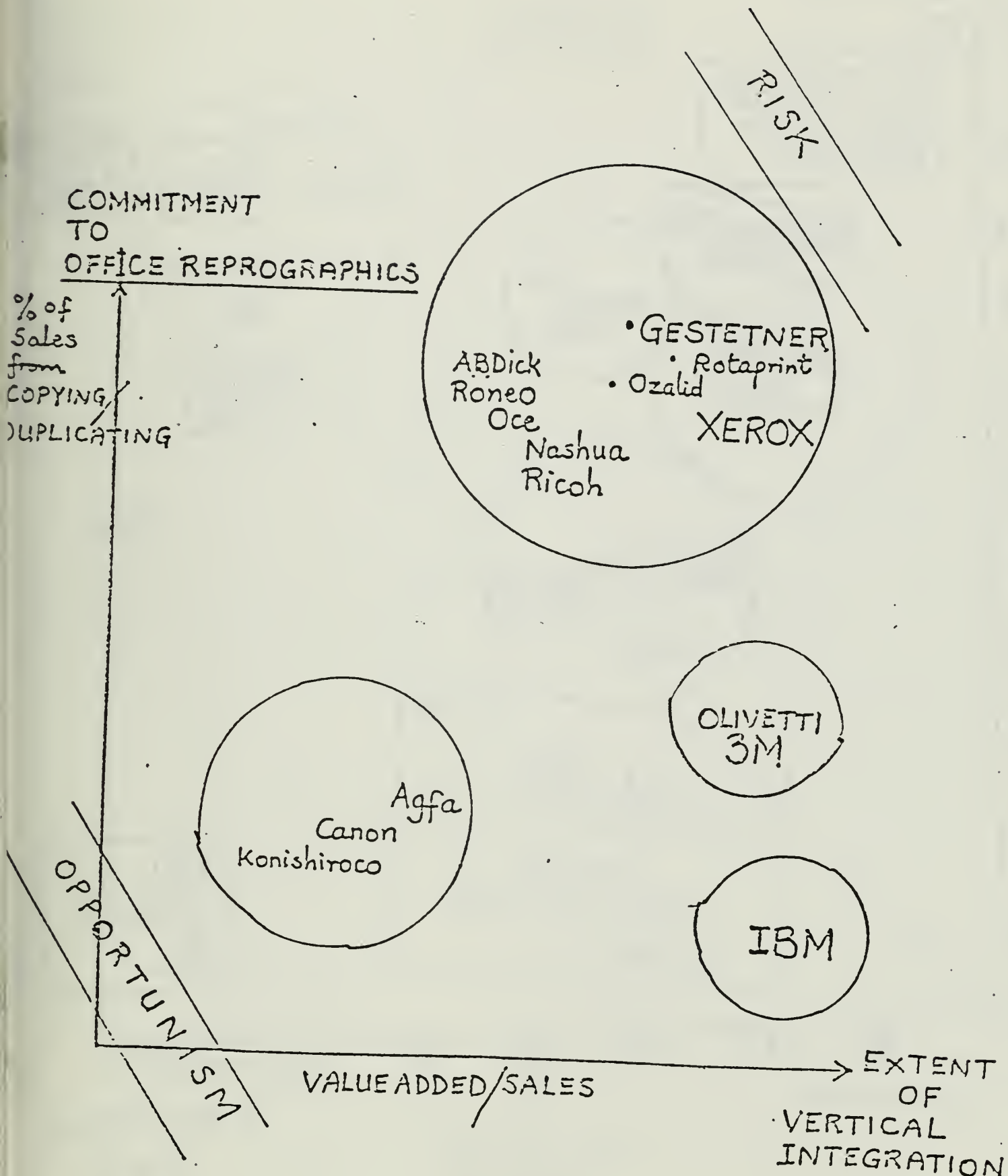

RISK
COMMITMENT TO OFFICE REPROGRAPHICS
% of Sales from COPYING/DUPLICATING
GESTETNER
Rotaprint
Ozalid
AB Dick
Roneo
Oce
Nashua
Ricoh
XEROX
OLIVETTI
3M
Agfa
Canon
Konishiroco
IBM
OPPORTUNISM
VALUE ADDED/SALES
EXTENT OF VERTICAL INTEGRATION

TABLE 13

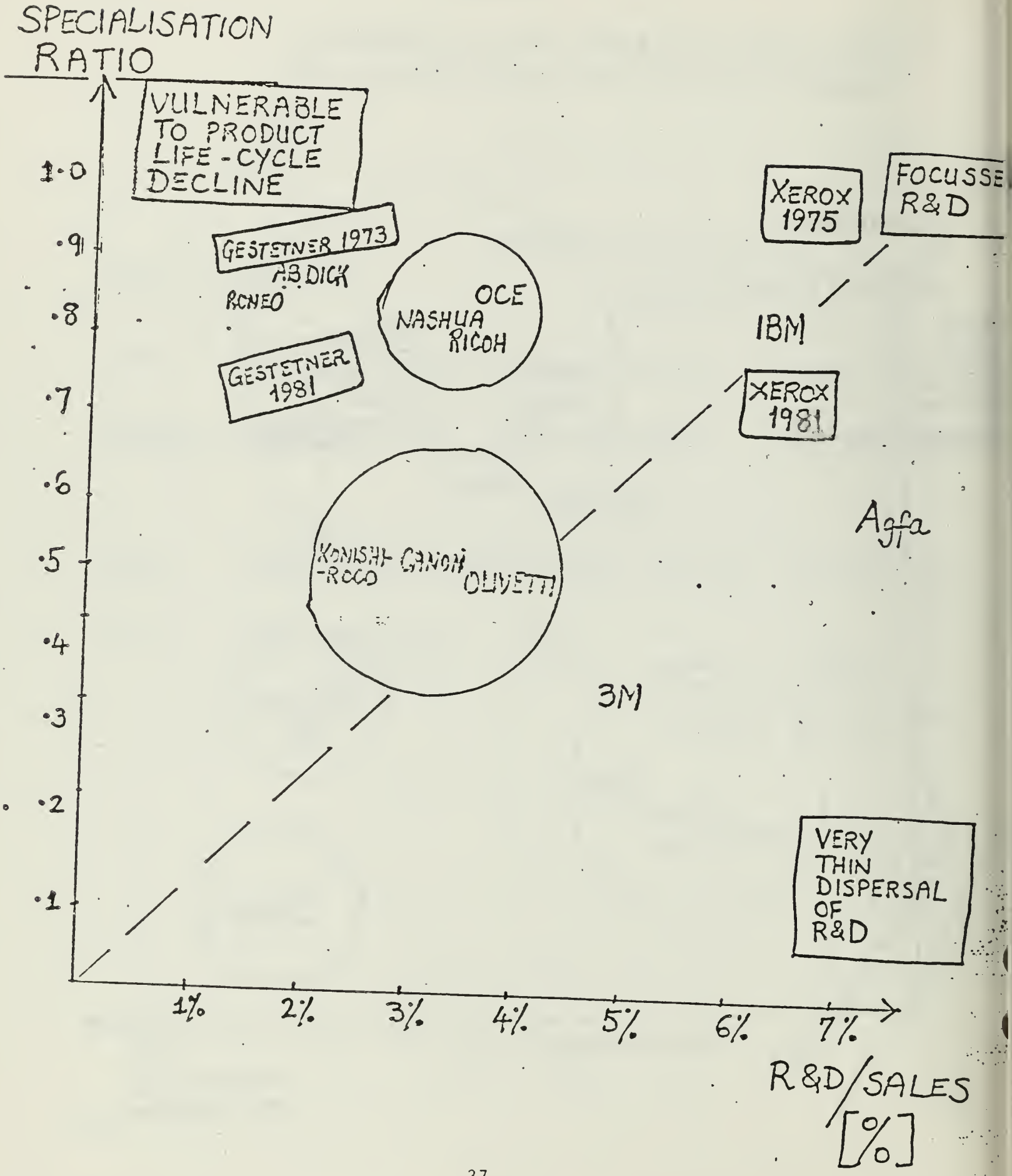

SPECIALISATION RATIO
VULNERABLE TO PRODUCT LIFE-CYCLE DECLINE
1·0
·9
·8
·7
·6
·5
·4
·3
·2
·1
GESTETNER 1973
A.B. DICK
RONEO
GESTETNER 1981
OCE
NASHUA
RICOH
KONISHI-ROCO
CANON
OLIVETTI
3M
XEROX 1975
FOCUSSED R&D
IBM
XEROX 1981
Agfa
VERY THIN DISPERSAL OF R&D
1%
2%
3%
4%
5%
6%
7%
R&D/SALES [%]

TABLE 14

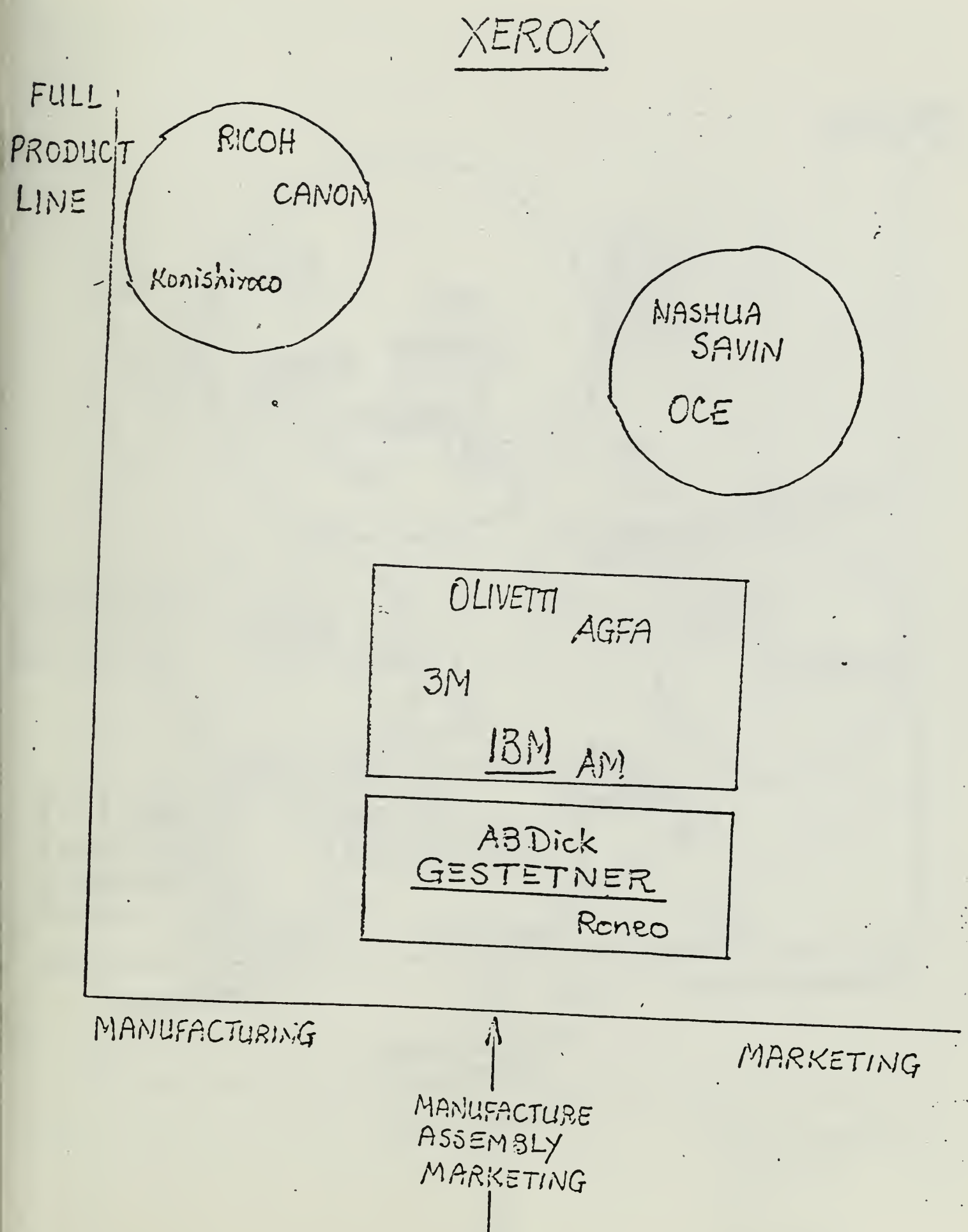

XEROX
FULL PRODUCT LINE
RICOH
CANON
Konishiroco
NASHUA
SAVIN
OCE
OLIVETTI
AGFA
3M
IBM
AM
AB Dick
GESTETNER
Roneo
MANUFACTURING
MARKETING
MANUFACTURE
ASSEMBLY
MARKETING

TABLE 13

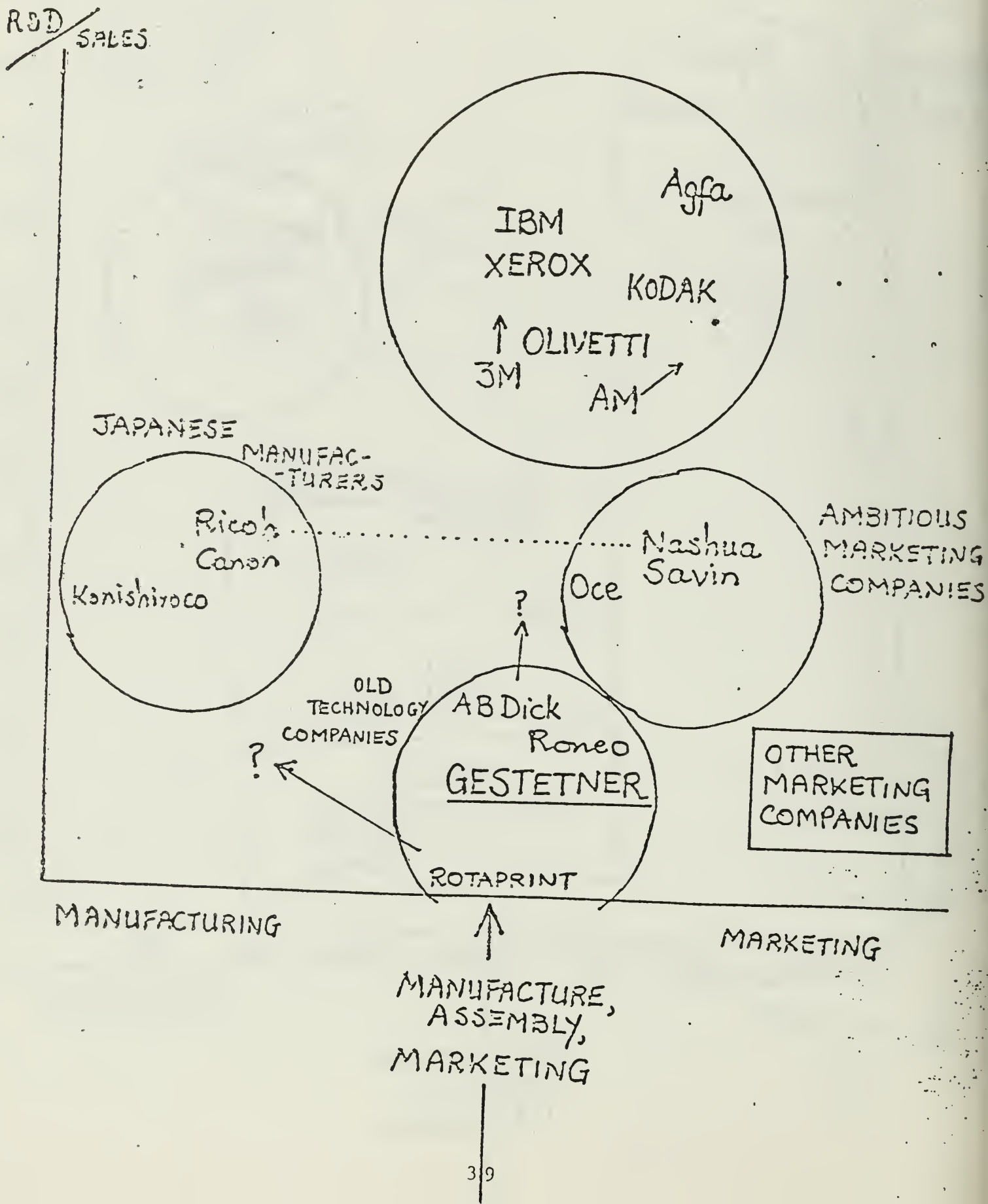
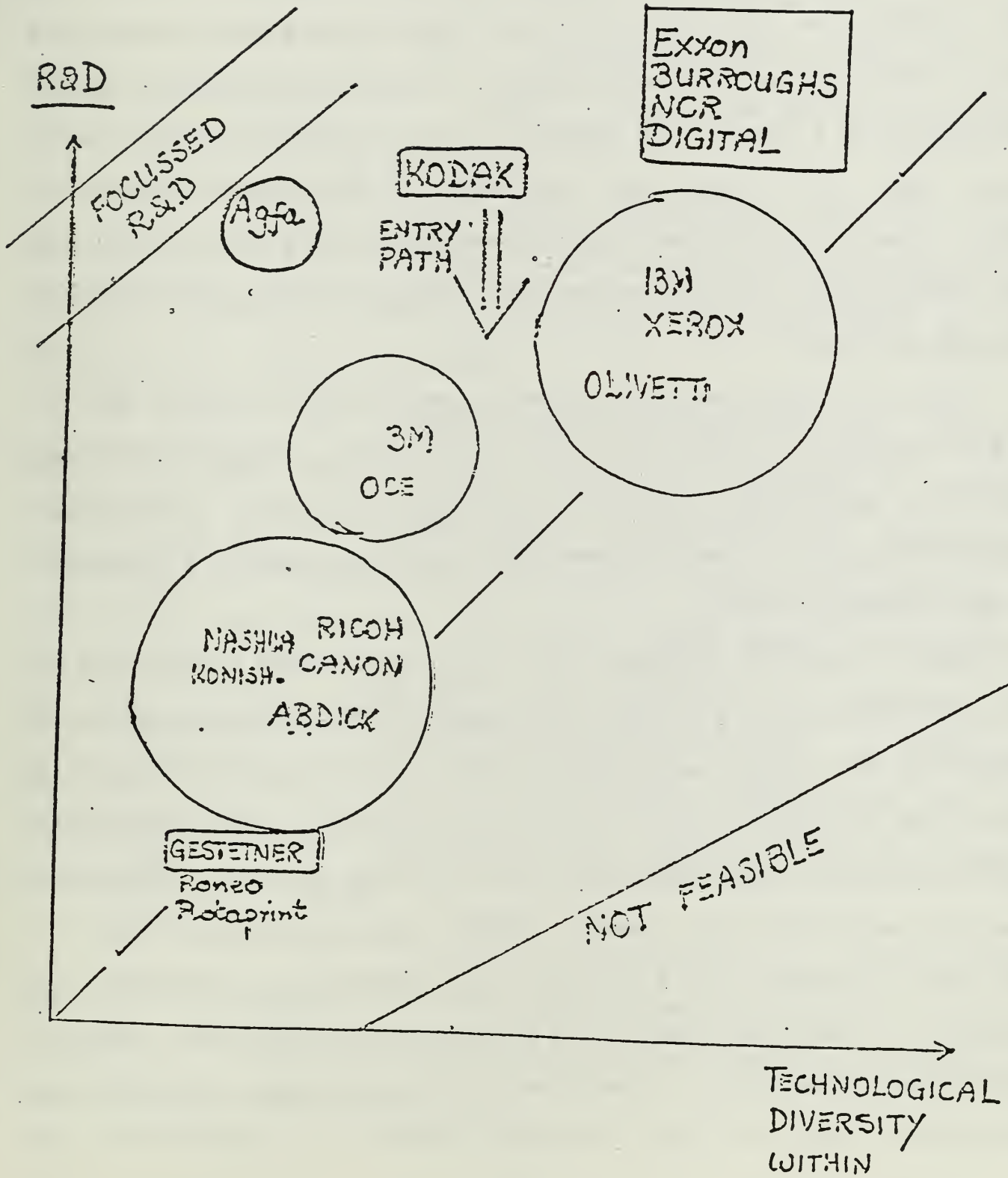

R&D
SALES
IBM
XEROX
Agfa
KODAK
OLIVETTI
3M
AM
JAPANESE
MANUFAC-
-TURERS
Ricoh
Canon
Konishiroco
Nashua
Savin
Oce
AMBITIOUS
MARKETING
COMPANIES
?
OLD
TECHNOLOGY
COMPANIES
?
AB Dick
Roneo
GESTETNER
ROTAPRINT
OTHER
MARKETING
COMPANIES
MANUFACTURING
MARKETING
MANUFACTURE,
ASSEMBLY,
MARKETING

TABLE 16


R&D
FOCUSSED R&D
Agfa
KODAK
ENTRY PATH
Exxon
BURROUGHS
NCR
DIGITAL
IBM
XEROX
OLIVETTI
3M
OCE
NASHUA
KONISH.
RICOH
CANON
ABDICK
GESTETNER
Ronzo
Rotaprint
NOT FEASIBLE
TECHNOLOGICAL DIVERSITY WITHIN "INFOTECH"

strategic dimensions and competitive barriers that seem to reflect the characteristics of the main types of strategies identified in Tables 8 through 11.

For example, Table 12 shows the firms mapped in relation to the extent of vertical integration (the length of the value-added chain) and the degree of committment of the firm to office reprographics (a variable which differentiates between single product and related product firms). We have characterized the positioning of firms in the mapping space in terms of opportunism versus risk. It is apparent that some of the single-technology firms, - Xerox, Rotaprint, Ozalid and Gestetner - are adopting risky strategies relative to the more opportunistic risk-balanced strategy of Canon.

Table 13, which maps the firm's specialization ratio against its R&D capability shows the very traditional, single-technology firms, e.g. Gestetner as being vulnerable to product life cycle decline relative to the focussed R&D strategies adopted by Canon, IBM and latterly Xerox.

Table 14 and 15 together link the value-added dimensions to the scope of product line and R&D capability. Indeed, Table 15 categorizes the groups according to the nature of technology (old versus new e.g. Gestetner v. Xerox), marketing companies (e.g. Nashua and Savin) and manufacturing oriented, process innovation types of companies (e.g. Canon, Ricoh). The arrows on Table 15 show the problems faced by the old technology companies in determining which strategic moves they should follow. Should they target movement to a manufacturing grouping, a technology grouping or define a new grouping based on cooperation and

focussedness of skills?

Table 16 is a more speculative mapping in that it seeks to capture the potential behavior of new entrants and competitors (i.e., competition across as well as within industries) from a wider "industry" setting-information technology. An entry path for Kodak is drawn in order to show a direction of entry. What Burroughs or NCR might do, or the positioning of Sharp on this space, provides creative, insightful questions for the strategist in developing strategic posture.

These strategic group maps, therefore, provide useful cognitive frames for making sense of the sets of current and future strategic positions which are possible as the reprographics industry evolves.

In summary, it is clear that this type of "rich" industry study, although limited mainly to Britain, provides a valuable longitudinal analysis rather than a cross-sectional snapshot of corporate strategies. This allows strategic patterns to be identified (see Table 5) and throws light upon the strategic characteristics of first-movers in technology in comparison to later, perhaps more product-diversified entrants. In addition, types of strategies and key strategic dimensions can be identified which, in turn, means that more relevant strategic groupings can be formed.

This study also led to the formulation of conclusions regarding the behavior of firms in declining businesses, the form of new entry competition and the process of industry evaluation. These are summarized as follows:

(i) Behavior of Firms in Declining Industries

When the threat of technology change is perceived, the first response of firms is to improve their old products. As a result the old technology reaches its peak after the advent of the new technology. The need, however, is for such firms to re-define their business. It emerges that the single-technology reprographics firms of half a century ago which failed to do so found themselves relegated to an insignificant position, while the successful firms are those that continually re-defined their concept of their business across industries.

(ii) The Forms of New Entry

The process of new entry in this study was analyzed within the framework of the firm's strategic decisions and the strategic groupings within and across industries. It is found that firms may enter one or more market segments and firms operating in one segment may move to another. Movement in or out of segments may be determined not so much by the industry-wide barriers as by mobility barriers surrounding particular segments. This also provides the opportunity for firms to make a gradual entry into an industry, treating each investment stage as an incremental decision.

(iii) The Process of Industry Evolution

Step-changes in technology lead to changes in market structure and competitive conditions and to the formation of new sets of competitors. The entry strategy chosen by these competitors is also important in determining the change in market structure. The height of entry barriers changes, cost conditions change and new ways of segmentation become available to suppliers as the extent and nature of product differentiation changes.

Although market structure does influence the conduct of firms, this structure is itself, to a great extent, the outcome of the strategic decisions of firms. It is these strategic moves, together with the technological changes causing disturbances in market structure, that lead to the formation and re-formation of "strategic groups".

Conclusions

The concept of research based upon "rich" industry histories has been explored in this paper. The premise is that insights about strategic interaction and the formulation of competitive

strategy within industries should be based upon examination not only of current strategic conduct but also of the evolution of industry structure. The reprographics study suggests that the study of sources of complexity within industries, of the process of industry evolution, of the emergence of new strategies and competitors and of strategic groupings illuminates our ability to make sense of competitive strategy. Yet no study can be "rich" enough or exhaustive enough in scope (whether geographical or analytical) to address all problems. But it can highlight the dynamic nature of industry evolution, the range of strategies and positions occupied by firms over time and the sometimes temporary nature of market leadership by "first-movers" or pioneers in markets.

What is needed now is a consolidation of research themes and the development of richer theory at the firm level. Single industry studies focussed on competitive strategy must require the use of existing economic theory as a benchmark model and also engineer the incorporation of the richness of firm-level behavior into the newer "strategic theories of the firm". Porter (1980 and 1982), Porter and Spence (1982), Caves (1980), Teece (1980) and Rumelt (1981) are "first-movers" in this endeavor. They will clearly be further aided by additional industry studies incorporating the strengths of the industry history approach.

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